

**WE CLAIM:**

1. ~~A method for vending beverages packaged in sealed containers, comprising:~~

- a. storing a plurality of packaged beverages in selectable queues of containers of such beverages within a vending machine;
- b. aligning a robotic assembly in the machine in registration with a customer selected one of said beverage container queues;
- c. transferring one of the beverage containers from the selected container queue to the robotic assembly;
- d. carrying the transferred beverage container to a delivery port of the vending machine; and
- e. presenting the carried beverage container at the delivery port for customer removal from the vending machine; wherein the entire process is performed without dropping or subjecting the container to severe impact forces.

2. The method of Claim 1, including the step of arranging the beverage containers on shelves within the machine in ordered contained rows of said containers, said rows extending generally in a direction from front to back of the machine.

3. The method of Claim 2, wherein the step of arranging said containers includes separating said rows of containers by shelf dividers extending generally in a direction from front to back of the machine.

4. The method of Claim 2, including the step of inclining at least one of said beverage containing shelves at an inclined angle to the horizontal from front to back of the shelf; whereby containers carried by said shelf are urged by gravity toward the front of the shelf.

5. The method of Claim 1, including the step of arranging a plurality of the beverage containers in contained alignment within a plurality of selectable identifiable

trays within the vending machine, said trays having at least a portion thereof extending in the direction from front to back of the machine.

6. The method of Claim 5, including the step of configuring said plurality of trays in generally vertical columns as viewed from the front of the machine.

7. The method of Claim 6, including the step of selectably varying the vertical separation distance between adjacent said trays in a said column, to accommodate beverage containers of varied heights.

8. The method of Claim 5, including the step of inclining at least one of said beverage trays at an inclined angle to the horizontal from front to back of the tray; whereby said containers carried by said tray are urged by gravity toward the front of the tray.

9. The method of Claim 1, further including the step of advancing said plurality of beverage containers within at least one of said queues toward a dispensing end of said queue; wherein said robotic assembly is aligned in registration with said dispensing end of said queue; and wherein said one beverage container transferred from said selected queue is transferred from said dispensing end of said queue.

10. The method of Claim 1, wherein the step of carrying includes moving said transferred beverage by said robotic assembly in a generally vertical X-Y plane of travel within said vending machine.

11. The method of Claim 1, wherein the step of presenting the beverage container includes opening a delivery door at said delivery port to enable a customer to reach into and to remove the beverage container from the delivery port.

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12. The method of Claim 1, wherein the beverage container is presented for customer removal generally from thigh to waist height.

13. The method of Claim 1, wherein the step of transferring one of the beverage containers from the selected container queue comprises sliding said one beverage container from said container queue into retaining engagement by the robotic assembly.

14. The method of Claim 1, further including retaining a plurality of beverage containers in said queue by retainably preventing a first-in-line container from moving out of said queue.

15. The method of Claim 14, wherein the step of transferring one of the beverage containers from the selected container queue includes releasing said first-in-line container for movement by gravity into said robotic assembly.

16. The method of Claim 15, including retaining a second-in-line and successively aligned ones of said beverage containers in said selected queue from moving in said queue while said first-in-line container is moving into said robotic assembly.

17. The method of Claim 14, wherein said retaining of the first-in-line and other beverage containers within said queue is performed by a passive restraint apparatus requiring no active power consuming components.

18. The method of Claim 1, wherein the step of transferring said one beverage container is achieved through energy provided by said robotic assembly.

19. The method of Claim 1, including the step of visually presenting said beverages of said selectable queues to a customer through a generally transparent viewing panel of the vending machine prior to customer selection of a beverage.

20. A method of vending bottled beverages from a vending machine of the type having a transparent front viewing panel that enables customer viewing of the actual beverages held by the machine and available for vending, comprising the steps of:

- a. aligning a plurality of bottled beverages in at least two ordered queues of said beverages;
  - b. providing a customer selection input identifiable with at least one of said two ordered queues of beverages;
  - c. removing a bottled beverage from said one of said ordered queues in response to said customer selection input; and
  - d. moving said removed bottled beverage to a delivery port of the machine;
- wherein said removing and moving steps are smoothly performed without dropping or subjecting the bottled beverage to sharp impact forces.

21. The method of Claim 20, wherein the step of removing the bottled beverage comprises removing the bottled beverage from said one of the ordered queues by means of a robotic assembly.

22. The method of Claim 21, wherein the step of moving the bottled beverage comprises smoothly moving the bottled beverage by said robotic assembly in a generally vertical X-Y plane within a vend selection space of the vending machine.

23. The method of Claim 20, wherein the step of removing said bottled beverage comprises smoothly sliding said bottled beverage being removed from said one of said ordered queues into a robotic assembly.

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24. The method of Claim 23, wherein the step of removing said bottled beverage includes releasing an escapement mechanism associated with said one of said ordered queues for enabling the bottled beverage being removed to slide by gravity into said robotic assembly.

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25. The method of Claim 24, wherein the step of releasing an escapement mechanism comprises moving said robotic assembly so as to operatively engage a cam release assembly of the escapement mechanism.

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26. The method of Claim 20, wherein the step of moving said bottled beverage comprises moving said bottled beverage to a delivery port positioned at a height of greater than 27 inches above the surface that supports the vending machine.

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27. ~~A method of vending discrete products from a vending machine of the type~~

having a transparent viewing panel for customer viewing and selection of the products to be vend- ed, and support means for supportably holding said products for visual presentation to a customer through said viewing panel; comprising the steps of:

a. ordering said products in a plurality of selectable queues of said products on said support means such that a foremost one of said products in each of said queues addresses the viewing panel at a dispensing end of its associated queue;

b. moving a capture assembly into alignment with the dispensing end of a customer selected one of said queues;

c. transferring the foremost one of said products from said customer selected one of said queues into retainment by said capture assembly;

d. moving said ~~capture~~ assembly with its retained product in view of said viewing panel to a delivery port;

e. ~~enabling customer removal of said retained product from said capture assembly at said delivery port; and~~

f. wherein the steps of transferring and moving said foremost product from said selected queue to said delivery port are performed without dropping or subjecting

~~said foremost product to sharp impact forces.~~

~~26~~  
~~28.~~

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28. The method of Claim 27, wherein the step of transferring said foremost one of said products comprises the steps of:

a. moving said capture assembly to activate an escapement mechanism at the dispensing end of said customer selected one of said queues; and

b. sliding said foremost one of said products past said escapement mechanism and into said capture assembly.

<sup>27</sup>  
~~29.~~ The method of Claim <sup>26</sup>~~28~~, wherein the step of moving said capture assembly to engage said escapement mechanism comprises rotating said capture assembly about a generally horizontal pivot axis.

<sup>28</sup>  
~~30.~~ The method of Claim <sup>25</sup>~~27~~, wherein the step of moving the capture assembly into alignment with the dispensing end of the customer-selected queue includes moving and retaining the position of said capture assembly in the vertical direction into a vertical alignment accuracy of better or equal to 1/32 inch.

<sup>29</sup>  
~~31.~~ The method of Claim <sup>28</sup>~~30~~, wherein the step of moving the capture assembly into alignment comprises moving the capture assembly with at least one gear drive motor.

<sup>30</sup>  
~~32.~~ The method of Claim <sup>29</sup>~~31~~, wherein said gear drive motor operatively engages a rack member.

<sup>31</sup>  
~~33.~~ The method of Claim <sup>25</sup>~~27~~, wherein the step of moving said capture assembly into alignment with said selected queue comprises moving said capture assembly generally along X and Y coordinates of a generally vertical X-Y plane, and wherein said movement along said X and Y coordinates is performed by means of rack and pinion drive members.

<sup>32</sup>  
~~34.~~ The method of Claim <sup>25</sup>~~27~~, wherein said products include products of different sizes.

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35. The method of Claim <sup>25</sup>27, wherein said products include products of different shapes.

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36. The method of Claim <sup>25</sup>27, wherein said products include products of different weights.

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37. ~~A vending machine for beverages packaged in sealed containers, comprising:~~

- a. a storage facility defining an enclosed internal cavity and a container delivery port opening into said internal cavity;
- b. container holding means within said internal cavity for holding a plurality of selectable sealed beverage containers; said container holding means being disposed so as to define with said storage facility a vend selection space within said internal cavity;
- c. beverage container capture means for retainably removing one of said plurality of selectable beverage containers from said container holding means in response to a vend control signal;
- d. transport means operatively connected with said beverage container capture means for moving said beverage container capture means within said vend selection space in response to said vend control signal; and
- e. control means operatively connected with said capture means and with said transport means for producing and providing said vend control signal thereto to cause said capture means and said transport means to cooperatively capture a selected beverage container from said container holding means and smoothly carry said captured container through said vend selection space to said delivery port without dropping or ~~subjecting said selected beverage container to sharp impact forces.~~

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38. The vending machine of Claim <sup>35</sup>37, wherein said storage facility comprises: a chassis, and a door cooperatively mounted to said chassis for defining therewith said internal cavity.

<sup>37</sup>  
~~39.~~ The vending machine of Claim <sup>36</sup>~~38~~, wherein said door includes a transparent panel for enabling customer viewing of said plurality of selectable beverage containers therethrough.

<sup>38</sup>  
~~40.~~ The vending machine of Claim <sup>37</sup>~~39~~, wherein said door includes said container delivery port.

<sup>39</sup>  
~~41.~~ The vending machine of Claim <sup>38</sup>~~40~~, wherein said container delivery port is located to one side of said transparent panel.

<sup>40</sup>  
~~42.~~ The vending machine of Claim <sup>35</sup>~~37~~, further including refrigeration means operatively connected with said storage facility to cool at least a portion of said internal cavity.

<sup>41</sup>  
~~43.~~ The vending machine of Claim <sup>35</sup>~~37~~, wherein said container holding means includes shelf means operatively mounted within said internal cavity for maintaining said beverage containers in a plurality of selectable queues of said containers.

<sup>42</sup>  
~~44.~~ The vending machine of Claim <sup>41</sup>~~43~~, wherein said container delivery port is remotely located from said plurality of queues.

<sup>43</sup>  
~~45.~~ The vending machine of Claim <sup>41</sup>~~43~~, wherein said shelf means is configured to arrange said container queues such that a discharge end of said queues is positioned adjacent said vend selection space.

<sup>44</sup>  
~~46.~~ The vending machine of Claim <sup>43</sup>~~45~~, further including container release means operatively connected with at least one of said queues adjacent said discharge end thereof for selectably retaining said beverage containers in said one queue.



<sup>45</sup>  
~~47.~~ The vending machine of Claim <sup>44</sup>~~46~~, wherein said container release means comprises only passive components.

<sup>46</sup>  
~~48.~~ The vending machine of Claim <sup>44</sup>~~46~~, wherein said beverage container capture means includes means cooperatively engagable with said container release means of said one queue for activating said container release means when removing a container from said container holding means.

<sup>47</sup>  
~~49.~~ The vending machine of Claim <sup>46e</sup>~~48~~, wherein said container release means includes a cam assembly, and wherein said capture means cooperatively engages said cam assembly.

<sup>48</sup>  
~~50.~~ The vending machine of Claim <sup>4f</sup>~~49~~, wherein said shelf means include means for maintaining said beverage containers in said queues at an angle inclined with respect to the horizontal.

<sup>49</sup>  
~~51.~~ The vending machine of Claim <sup>48</sup>~~50~~, wherein said angle is from about 8 degrees to 20 degrees with the horizontal.

<sup>50</sup>  
~~52.~~ The vending machine of Claim <sup>49</sup>~~51~~, wherein the angle is from about 10 degrees to 15 degrees with the horizontal.

<sup>51</sup>  
~~53.~~ The vending machine of Claim <sup>48</sup>~~50~~, wherein said shelf means includes means for adjusting said angle.

<sup>52</sup>  
~~54.~~ The vending machine of Claim <sup>5151</sup>~~53~~, wherein said shelf means includes means for selectively adjusting the angles of individual ones of said queues.

<sup>53</sup>  
~~55.~~ The vending machine of Claim <sup>41</sup>~~43~~, wherein said shelf means includes a plurality of container trays having discharge ends positioned adjacent said vend selection space.

<sup>54</sup>  
~~56.~~ The vending machine of Claim <sup>53</sup>~~55~~, further including mounting means for mounting said plurality of trays in generally vertical columns.

<sup>55</sup>  
~~57.~~ The vending machine of Claim <sup>53</sup>~~55~~, wherein said trays further include container release means operatively connected with at least one of said trays adjacent said discharge end thereof for selectively retaining said beverage containers in a queue within said one tray.

<sup>56</sup>  
~~58.~~ The vending machine of Claim <sup>55</sup>~~57~~, wherein said container release means comprises only passive components.

<sup>57</sup>  
~~59.~~ The vending machine of Claim <sup>35</sup>~~57~~, including release means cooperatively connected with said container holding means and activatable by said beverage container capture means for releasing by gravity a selected container from said container holding means to said beverage container capture means.

<sup>58</sup>  
~~60.~~ The vending machine of Claim <sup>35</sup>~~57~~, wherein said transport means comprises rack and pinion means for operatively moving said beverage container capture means in said vend selection space relative to said container holding means.

<sup>59</sup>  
~~61.~~ The vending machine of Claim <sup>58</sup>~~60~~, wherein said rack and pinion means includes at least one gear track and at least one dc motor having an output gear for cooperatively engaging said gear rack , and wherein said dc motor is operatively connected for energization by said vend control signal.

<sup>60</sup>  
~~62.~~ The vending machine of Claim <sup>35</sup>~~57~~, wherein said transport means includes an X-Y drive apparatus for accurately moving said capture container means in two orthogonal directions within said vend selection space.

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63. The vending machine of Claim 35, further including detection means operatively connected with said beverage container capture means for detecting the presence or absence of a said container within said beverage container capture means.

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64. The vending machine of Claim 35, wherein said control means includes input selection means for receiving customer input stimuli and for producing said vend control signal in response thereto.

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65. ~~A vending machine for vending selectable products comprising:~~

a. a product storage chassis including a door, cooperatively forming an internal cavity; said chassis including a transparent panel portion for enabling viewing therethrough into said internal cavity and a product delivery port spaced from said transparent panel portion;

b. product selection means operable by a customer for generating a vend control signal indicative of a product selection of the customer;

c. support means operatively mounted within said internal cavity of the product storage chassis for supporting said products in a plurality of selectable and separate ordered queues of such products; and

d. a robotic assembly mounted to said chassis and operatively movable within said internal cavity in response to said vend control signal to rapidly and smoothly remove and carry a selected said product from its associated said ordered queue to said product delivery port without dropping or jarring the selected product; wherein a customer can view the entire product removal and carrying operations of a vending cycle of the machine through said transparent panel portion.

64  
66. The vending machine of Claim 63, wherein said product delivery port is located generally at about thigh or waist level.

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- a. an X-Y support frame mounted in said chassis and at one end of said support means;
- b. a shuttle, movably mounted to said X-Y support frame for controlled rapid uniform movement therealong in an X direction;
- c. a carriage assembly operatively connected to said shuttle for controlled movement therealong in a Y direction;
- d. a capture mechanism operatively mounted to said carriage assembly for removing and carrying said selected product from its associated ordered queue.

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74. The vending machine of Claim 73, wherein said shuttle is mounted to said X-Y support frame by a rack and pinion assembly.

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75. The vending machine of Claim 74, wherein said rack and pinion assembly includes:

- a. a pair of spaced generally horizontal racks forming a part of said X-Y support frame, said horizontal racks being positioned adjacent upper and lower portions of said internal cavity;
- b. a pair of spur gears cooperatively mounted to said shuttle for simultaneous movement and respectively operatively engaging said pair of spaced racks; and
- c. an X-drive motor mounted to said shuttle and having an output gear operatively engaging one of said spur gears; wherein said X-drive motor moves said shuttle in the X-direction along said horizontal racks.

74  
76. The vending machine of Claim 75, wherein said X-drive motor is a reversible dc motor.

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77. The vending machine of Claim 74, wherein said carriage assembly is operatively connected to said shuttle by a rack and pinion assembly.

<sup>76</sup>  
~~78.~~ The vending machine of Claim <sup>71</sup>~~73~~, wherein said carriage assembly is operatively connected to said shuttle by a rack and pinion assembly.

<sup>77</sup>  
~~79.~~ The vending machine of Claim <sup>76</sup>~~78~~, wherein said rack and pinion assembly includes:

- a. a generally vertical rack mounted to said shuttle;
- b. a slide assembly slidably connecting said carriage assembly to said shuttle, for movement in said Y-direction;
- c. a drive gear cooperatively engaging said vertical rack; and
- d. a Y-drive motor mounted to said carriage assembly and operatively connected to move said drive gear; wherein said Y-drive motor moves said carriage in the Y-direction along said vertical rack and slide assembly.

<sup>78</sup>  
~~80.~~ The vending machine of Claim <sup>77</sup>~~79~~, wherein said Y-drive motor is a reversible dc motor.

<sup>79</sup>  
~~81.~~ The vending machine of Claim <sup>78</sup>~~80~~, further including power means for energizing said Y-drive motor with a pulse-width-modulated signal in response to said vend control signal.

<sup>80</sup>  
~~82.~~ The vending machine of Claim <sup>71</sup>~~73~~, wherein said capture mechanism includes Z-drive means for moving at least a portion of said capture mechanism in a Z-direction, orthogonal to a plane defined by said X and said Y directions.

<sup>81</sup>  
~~83.~~ The vending machine of Claim <sup>80</sup>~~82~~, wherein said support means includes at least one release assembly operatively aligned with at least one of said ordered queues of products for selectively releasing said products from said one queue one at a time in consecutive ordered manner; and wherein said capture mechanism activates said release assembly when said capture mechanism moves in said Z-direction.

<sup>82</sup>  
84. The vending machine of Claim <sup>81</sup>~~83~~, wherein said one release assembly comprises all passive components.

<sup>83</sup>  
85. The vending machine of Claim <sup>63</sup>~~65~~, wherein said support means is configured to support said products of differing shapes within said queues; and wherein said robotic assembly is operable to remove and carry said selected products of differing shapes.

<sup>84</sup>  
86. The vending machine of Claim <sup>63</sup>~~65~~, wherein said support means is configured to support said products of differing sizes within said queues; and wherein said robotic assembly is operable to remove and carry said selected products of differing sizes.

<sup>85</sup>  
87. The vending machine of Claim <sup>63</sup>~~65~~, wherein said support means supports at least one of said plurality of ordered queues of said products at an inclined angle to the horizontal.

<sup>86</sup>  
88. The vending machine of Claim <sup>85</sup>~~87~~, wherein said robotic assembly is operable to remove said selected products from said at least one inclined queue by sliding said selected products with the help of gravity into said robotic assembly.

<sup>87</sup>  
89. The vending machine of Claim <sup>85</sup>~~87~~, wherein said support means includes a low friction floor portion in said at least one of said queues disposed at an inclined angle for supporting said products within that queue.

<sup>88</sup>  
90. A carriage assembly for use with a vending machine of the type having: a chassis defining an internal cavity, a front door forming one side of said chassis; a product support assembly mounted in said chassis and configured to hold a plurality of products to be vended in separate ordered queues of said products, such that one end of said queues address a dispensing end of said product support assembly, wherein the volume between said dispensing ends of said product support assembly and said door defines a vend selection space; said carriage assembly comprising:

- a. an X-rail assembly mounted to said chassis in generally horizontal orientation;
- b. a Y-rail assembly mounted to said X-rail assembly in generally vertical orientation and configured for movement along said X-rail assembly;
- c. an X-drive motor mounted for movement with said Y-rail assembly for controlling movement of said Y-rail assembly along said X-rail assembly;
- d. a carriage mounted to said Y-rail assembly for movement therealong;
- e. a Y-drive motor mounted for movement with said carriage for controlling movement of said carriage along said Y-rail assembly; and
- f. said carriage assembly being configured to accurately move, position and hold said carriage relative to said product support assembly within said vend selection space.

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91. The carriage assembly of Claim 88, wherein said X-rail assembly includes upper and lower spaced rails, and wherein said Y-rail assembly has opposed ends that are operatively mounted between said upper and lower spaced rails for movement therealong.

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92. The carriage assembly of Claim 89, wherein said upper and lower rails comprise elongate gear racks, and wherein said X-drive motor comprises a motor with an output gear drive for cooperatively engaging at least a first of said spaced rails.

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93. The carriage assembly of Claim 90, further including a gear extension operatively connected with said X-drive motor output gear drive and with a second of said spaced rails such that energization of said X-drive output gear drive simultaneously positively moves the opposed ends of said Y-rail assembly along said spaced rails.

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94. The carriage assembly of Claim 89, wherein said X-drive motor is a dc motor.



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95. The carriage assembly of Claim 93, wherein said Y-rail assembly includes an elongate gear rack extending therealong, and wherein said Y-drive motor comprises a motor with an output drive gear mounted to cooperatively engage said elongate gear rack of said Y-rail assembly.

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96. The carriage assembly of Claim 93, further including a slide assembly cooperatively connecting said carriage to said Y-rail assembly for guiding said carriage along said Y-rail assembly and for preventing pivotal motion of said carriage about a vertical axis.

95  
97. The carriage assembly of Claim 93, wherein said Y-drive motor is a dc motor, and further including power control means connected with said Y-drive motor for providing a pulse-width-modulated drive signal to said Y-drive motor.

96  
98. The carriage assembly of Claim 97, wherein said carriage can attain movement positioning and positional maintenance of said carriage along said Y-rail assembly to within an accuracy of 1/32 inch.

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99. The carriage assembly of Claim 97, wherein said carriage can attain movement positioning and positional maintenance of said carriage along said Y-rail assembly to within an accuracy of 1/64 inch.

98  
100. The carriage assembly of Claim 93, including a Y-position location sensor for accurately locating the vertical position of said carriage.

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101. The carriage assembly of Claim 100, wherein said Y-position location sensor comprises an optical encoder operatively connected with said Y-drive motor.

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100  
102. The carriage assembly of Claim 90, wherein said X-rail assembly includes an X-position location sensor for accurately determining the position of the Y-rail assembly relative to said X-rail assembly.

101  
103. The carriage assembly of Claim 90, including control means for providing coordinated drive signals to said X-drive and said Y-drive motors for simultaneously moving said Y-rail assembly and said carriage to a desired X-Y location within said vend selection space.

102  
104. A product release and capture assembly for use in a vending machine of the type having: a chassis defining an internal cavity; a product support assembly mounted in said chassis and configured to hold a plurality of products to be vended in separate ordered queues of said products; said product support assembly being arranged and configured to define a dispensing end of said queues, wherein a vend selection space is defined in said internal cavity adjacent said dispensing ends of said queues; said product support assembly further including means for urging products in said queues to move toward the dispensing ends of said queues; a carriage; drive means connected to controllably move said carriage generally in an X-Y coordinate plane within said vend selection space into alignment with the dispensing end of a selected one of said product queues; said product release and capture assembly comprising:

a. an escapement mechanism mounted to said product support assembly of said selected one of said product queues adjacent the dispensing end thereof; said escapement mechanism comprising:

i. a first engagement member configured to selectively engage a first-in-line product at the dispensing end of said selected queue;

ii. a second engagement member configured to selectively engage a second-in-line product aligned in said queue immediately adjacent to and behind said first-in-line product;

iii. a connector operatively connecting said first and said second engagement members for cooperative movement; said connector being configured to

move said first engagement member into engaging and disengaging positions relative to said first-in-line product while simultaneously respectively moving said second engagement member into disengaging and engaging positions relative to said second-in-line product;

iv. bias means operatively connected with said connector for normally moving said first engagement member into its said engaging position; and

v. a force receiving surface operatively connected with said connector for receiving an activating force tending to move said connector against the normal bias of said bias means; and

b. a capture receptacle, movably mounted to said carriage, for movement between first and second positions; said capture receptacle when operable in said first position enabling free movement of said capture receptacle and said carriage relative to said escapement mechanism in said vend space; and being operable when moving to said second position, and when said carriage is positioned in operative alignment with the dispensing end of the selected queue, to engage said force receiving surface to operatively move said connector against the bias of said bias means, to move said first engagement member toward its disengaging position, thereby releasing said first-in-line product for movement out of the dispensing end of the queue and into said capture receptacle.

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105. The product release and capture assembly of Claim ~~104~~<sup>102</sup>, wherein said force receiving surface comprises a cam surface.

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106. The product release and capture assembly of Claim ~~105~~<sup>103</sup>, wherein said cam surface projects beyond the dispensing end of said product support assembly and at an angle relative to the general plane of said vend selection space.

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107. The product release and capture assembly of Claim ~~104~~<sup>102</sup>, wherein said connector is pivotally mounted to said product support assembly to one side of said selected queue

of products and about a first upright axis extending generally perpendicular to a dispensing direction in which said products move in said queue.

<sup>106</sup>  
~~108.~~ The product release and capture assembly of Claim <sup>105</sup>~~107~~, wherein said connector slidably engages said first engagement member.

<sup>107</sup>  
~~109.~~ The product release and capture assembly of Claim <sup>106</sup>~~108~~, wherein said first engagement member is pivotally mounted to said product support assembly to one side of said selected queue of products and about a second upright axis spaced in the dispensing direction from the first upright axis and extending generally perpendicular to the dispensing direction.

<sup>108</sup>  
~~110.~~ The product release and capture assembly of Claim <sup>107</sup>~~109~~, wherein said connector defines a slot therethrough; wherein said first engagement member extends through said slot; and wherein an edge of said slot slidably engages said first engagement member to pivot said first engagement member about said second axis.

<sup>109</sup>  
~~111.~~ The product release and capture assembly of Claim <sup>108</sup>~~110~~, wherein said first engagement member includes an arm portion extending from said second pivot axis toward a distal end, and a product engaging stop member connected at said distal end.

<sup>110</sup>  
~~112.~~ The product release and capture assembly of Claim <sup>109</sup>~~111~~, wherein said arm portion of said first engagement member extends through said connector slot; and wherein said connector and said first engagement member are cooperatively operable such that when said first engagement member is disposed in its engaged position, said arm portion of said first engagement member lies generally perpendicular to the dispensing direction, placing said product engaging stop member in the path of said first-in-line product of said queue; and when said first engagement member is disposed in its disengaged position, said arm portion thereof lies generally parallel to said

dispensing direction, with said product engaging stop member being positioned to one side of the first-in-line product as it advances in the dispensing direction.

<sup>111</sup>113. The product release and capture assembly of Claim <sup>106</sup>108, wherein the forces applied by said connector to said first engagement member exceed the combined forces of the aligned products of said selected queue tending to move said products down the queue in the dispensing direction.

<sup>112</sup>114. The product release and capture assembly of Claim <sup>106</sup>108, wherein said connector includes a rear pivot arm portion extending from said first pivot axis back toward said second engagement member, and a forward pivot arm portion extending from said first pivot axis toward said dispensing end and said force receiving surface.

<sup>113</sup>115. The product release and capture assembly of Claim <sup>112</sup>114, wherein said rear and said forward pivot arm portions of said connector define an obtuse angle about said first pivot axis.

<sup>114</sup>116. The product release and capture assembly of Claim <sup>105</sup>107, wherein said escapement mechanism further includes a generally vertical wall member for retaining one side of said products within said selected queue, and wherein said connector is pivotally mounted to said wall member.

<sup>115</sup>117. The product release and capture assembly of Claim <sup>107</sup>109, wherein said escapement mechanism further includes a generally vertical wall member of retaining one side of said products within said selected queue, and wherein said connector and said first engagement members are mounted about said first and said second pivot axes respectively to said wall.

<sup>116</sup>118. The product release and capture assembly of Claim <sup>102</sup>104, wherein said bias means is a spring.

<sup>117</sup>  
~~119.~~ The product release and capture assembly of Claim <sup>102</sup>~~104~~, wherein said escapement mechanism includes only passive components requiring no power energy sources.

<sup>118</sup>  
~~120.~~ The product release and capture assembly of Claim <sup>102</sup>~~104~~, wherein said capture receptacle is pivotally mounted to said carriage about a generally horizontal pivot axis, generally perpendicular to a dispensing direction in which said products move in the queue; wherein said capture receptacle slidably engages said force receiving surface as it moves to its said second position.

<sup>119</sup>  
~~121.~~ The product release and capture assembly of Claim <sup>102</sup>~~104~~, further including a drive motor operatively connecting said carriage and said capture receptacle for moving said capture receptacle between its said first and said second positions.

<sup>120</sup>  
~~122.~~ The product release and capture assembly of Claim <sup>119</sup>~~121~~, wherein said drive motor is mounted to said capture receptacle.

<sup>121</sup>  
~~123.~~ The product release and capture assembly of Claim <sup>102</sup>~~104~~, wherein said capture receptacle includes a floor portion configured to retainably support at least one of said products of said selected queue, said capture receptacle being configured such that said floor portion thereof aligns with a floor portion of said selected queue when said capture receptacle is positioned in its said second position; wherein said first-in-line product of said selected queue can smoothly slide from the dispensing end of said selected queue onto side floor portion of said capture receptacle.

<sup>122</sup>  
~~124.~~ The product release and capture assembly of Claim <sup>121</sup>~~123~~, wherein said floor portion of said capture receptacle includes a detent area for retainably holding a bottom edge of said product once said product slides into said capture receptacle.

<sup>123</sup>  
125. The product release and capture assembly of Claim <sup>121</sup>123, wherein said floor portion of said capture receptacle comprises low-friction material.

<sup>124</sup>  
126. The product release and capture assembly of Claim <sup>121</sup>123, wherein said floor portion of said capture receptacle comprises a ribbed configuration for reducing sliding friction.

<sup>125</sup>  
127. The product release and capture assembly of Claim <sup>121</sup>123, wherein the upper surface of said floor portion of said capture receptacle defines a first floor plane, and wherein the upper surface of the product support assembly portion defining the selected queue defines a second floor plane; and wherein said first and said second floor planes are generally aligned coplanar when said capture receptacle is disposed in its said second position.

<sup>126</sup>  
128. The product release and capture assembly of Claim <sup>102</sup>104, wherein said capture receptacle includes at least one upper product retainer member for stabilizing an upper portion of said first-in-line product received by said capture receptacle.

<sup>127</sup>  
129. The product release and capture assembly of Claim <sup>102</sup>104, wherein said capture receptacle includes a sensor for detecting the presence or absence of said product in said capture receptacle.

<sup>128</sup>  
130. The product release and capture assembly of Claim <sup>102</sup>104, wherein said capture receptacle, is generally characterized by an open first end that addresses said selected queue for receiving in unobstructing manner said first-in-line product from said queue, and a second end, opposite to said first end, having an access port sized sufficiently large to enable the product retained by said capture receptacle to be lifted and removed from said capture assembly through said access port.

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